The Sidereal Messenger.

Conducted by WM. W. PAYNE, Director of Carleton College Observatory.

"In the present small treatise I set forth some matters of interest to all observers of natural phenomena to look at and consider."—GALILEO, *Sidereus Nuncius*, 1610.

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Memorial Address in honor of FRIEDRICH WILHELM AUGUST ARGELANDER,

Delivered at the Anniversary and Festival of the Scientific society of Finland April 29, 1875, by A. KRUEGER.

[Translated from the Swedish and arranged for publication by Professors R. B. ANDERSON and EDWARD S. HOLDEN of the University of Wisconsin.]

NOTE BY THE TRANSLATORS:

As this biographical sketch relates especially to the period of ARGELANDER's residence in Finland, and as that period of his life is the least known, we have thought that a translation from the original Swedish would be welcome:

(*Continued from page 204.*)

The meridian observations just named, were interrupted for a short time soon after they were begun by an alarming event. In the journal of observations for Sept. 4, 1827, we find immediately after the observations of the star β Aquilae, that is to say in the evening the following entry:

Hic observationes terribili illo interceptae sunt incendio, quod totam fere urbem ad cinerem reduxit, observatorium vero, gratiae habeantur Deo Optimo Maximo, salvum intactumque reliquit.

It was the glare of that terrible conflagration which in two days destroyed the greater part of Abo, together with the building of the academy, the library and other collections, which had interrupted the observations. The observa-

tory was saved from the flames on account of its remote situation, but still the heat was so intense even there, that a few wooden beams, which accidentally lay on the roof, began to catch fire. Argelander and his watchman were during the conflagration continually engaged in hindering the fire from spreading to the observatory. It would take too long to give the details of this event and other circumstances connected with it. Meanwhile I cannot neglect to emphasize the laudable resolution with which the *consistorium accademicum* immediately after the fire sought to repair the losses suffered and to insure a continuation of the instruction for the impending fall term by securing temporary recitation rooms and dormitories for the students who were expected. All these efforts were, however, interrupted in consequence of a royal message published Oct. 21, 1827, in which was recommended the removal of the academy to Helsingfors under the name of the Imperial Alexanders University.

Soon after the fire, the 7th of September, the consistorium met at the observatory and there they held their sessions for some time. Even the rector's office and the treasury of the academy and such of its archives as were rescued were preserved at the observatory. The consistorium met here for more than a year, holding its last session in Abo the 12th of September 1828, and adjourning to meet in the Lenan chamber of Helsingfors for the purpose of dedicating the Alexanders University. We can readily understand that Argelander could not without great inconvenience to himself share his rooms with the consistorium, but still he did it cheerfully, and he knew above all how to arrange matters in such a way that the regular observations did not have to be interrupted for more than a few days.

By the new university statutes, which were adopted the 1st of October, 1828, Argelander's position was changed in many important respects. The directorship was raised to a regular professorship in astronomy, and Argelander was at once appointed as the first professor in this new chair. He was not appointed professor in the ordinary way and this fact possibly created some dissatisfaction among his col-

leagues. Furthermore a dispute in regard to his right to draw the salary intended for the professor of astronomy was decided by the highest authority in his favor. But as Argelander on this, as on all other occasions acted in an open and loyal manner and only demanded a correct interpretation of a law that was plain enough, the dissatisfaction, if it did exist, cannot have been very lasting.

It still took a long time before the observatory building projected for Helsingfors could be built. Argelander remained in Abo until 1831 and when the observations which needed to be done there for the Abo catalogue were completed, he asked for and received a year's vacation to visit his relatives in Prussia. He returned in 1832, published three volumes of observations (1830-1832) of which the first, which had been for the greater part completed before the Abo fire, had to be brought out in a new edition, since it together with Frankell's printing office had perished in the flames, and after his removal to Helsingfors where he temporarily occupied Rosenkampf's house near the Kasem market, he took his place in the consistorium for the first time Aug. 12. His first labor in Helsingfors was devoted to his catalogue Aboensis and to the new observatory which under the superintendence of Ergel was rising on the summit of the Ulrikborg mountain. In November 1834 this institution was so far completed that the observations with the meridian circle, which had been interrupted ever since 1831, could be begun again. They were continued until February 1837, when Argelander's career unexpectedly took a new turn.

In Prussia it had been determined to build a third observatory of the first rank, which was to look after the interests of the western part of the monarchy in the same manner as the observatories of Berlin and Konigsberg did for the other provinces. It followed as a matter of course that the new observatory would be united with the university of Bonn, which city, on account of its favorable situation in a mild climate, almost in the center of western Germany's commercial and thus also scientific highways, was especially suitable for such an institution, and especially as

the young and flourishing university had a claim to an observatory of its own. When this was done, the question was where to find a man equal to the task of making the plans for the proposed institution and in this respect Argelander had given splendid evidence of his ability in Helsingfors. That he also was a persona grata in his native land does not surprise us, and so it happened that as early as in the spring of 1836, before the question of Bonn observatory was decided, by a personal letter from the crown prince Argelander was invited to accept the position of astronomer in Bonn. This letter, which I possess in the original is characteristic of the intimacy and esteem with which Argelander was approached by his distinguished friend and protector and it may be of interest to some of my hearers to become acquainted with its wording. I therefore beg leave to read it:

ALTER FRITZ!

Ich hoffe endlich, dass unsere beyderseitigen Wuensche, Dich im deutschen Lande bey einer unserer Hochschulen angestellt zu sehen, in Erfuellung geht. Schon seit fast drei Wochen wollte ich Dir immer schreiben und Dir sagen, dass der Minister von Altenstein mir die unbeschreibliche Freude gemacht (bey der Anzeige vom traurigen Verlust des lieben Professor von Munchow zu Bonn) zu sagen, dass er Dich, lieber Fritz sogleich zu seinem Nachfolger vorschlagen wurde. Heut seh ich aus einem Briefe Deiner guten Mutter, dass auch sie schon von der Vacanz zu Bonn weiss, denn sie bittet mich, bey dieser Gelegenhet Deiner zu gedenken. Nein wahrlich! dessen bedurfte es nicht. Ich hatte Herrn von Altenstein so eindringlich meinen Wunsch deinetwegen und so oft vorgetragen, dass ich nicht zweifeln durfte, er werde diese Gelegenheit benutzen, um so mehr, da seine hohe Idee von Dir, nicht etwa allein daher rueht dass wir uns in Eurem alten Garten ein Jahr lang taglich gebalgt haben.

Schnuere jetzt Deine Siebensachen zusammen und bereite Dich auf die Reise an den prachtigen Rheinstrom, wenn Du nicht etwa in Deine finnischen Granitfelsen und den Fall von Imatra zu verliebt bist. Eine Sternwarte findest Du

leider! nicht, Altenstein aber hofft Deine Ernennung benutzen zu koennen, um die etablirung einer solchen zu Wege zu bringen. Geht Deine Mutter wohl mit Dir nach Bonn? Ich denke es immer. Wie wuerde ich mich freuen, Euch Lieben beyde dann bey mir zu sehen. Gott segne Dich.

FRIEDRICH WILHELM.

Berlin, 25 May, 1836.

Argelander thought he ought to obey this summons, particularly as his aged mother longed to see her only son whom she missed so much, return to his native land. The 14th of January, 1837 his respectful request to be permitted to resign his position addressed to His Imperial Majesty was brought up in the consistorium and the consistorium could not refuse to recommend its being granted, "although" (thus read the records of next day) "it was the greatest wish of this body to continue to retain in this chair a man, who during the fourteen years that he has served the Imperial Alexanders University, has in all respects and in a high degree won the esteem, friendship and confidence of all the members of the university." Not one of the men who was present at this meeting is now living, one after the other they have departed from this earth. Were this not so, they would certainly testify that these words were no mere formality or vain flattery. But the sincerity with which Argelander was respected and beloved by his friends, was sincerely returned by him, he never forgot them, but continued to take the deepest interest in their welfare. In the six hundred or more letters which I have from his hand there are constantly recurring questions in regard to his old acquaintances, or their children and grand-children, and his conversation often turned on Finland, on the time that he spent here so happily. I take the liberty on this occasion to speak of as a circumstance which strikingly proves his warm interest for everything that happened here.

It was during the Crimean war in the summer of 1855. In Germany they had already for a long time known that Sveaborg had been selected by the English for bombardment. Argelander was greatly worried about the possible fate of the observatory and the city behind it. He who

never unasked mixed himself with the affairs of others, made this one exception to his rule. He sent a letter to a very influential man in England in which he pointed out, how cruel and careless it would be if the expected cannonading were pointed against the observatory and the unprotected city. The contents of this letter came, as was intended, to the knowledge of the proper authorities and was answered, thanks to the humanity of the British government and to the influence of Argelander's name in England! with assurances that the city would not be attacked unnecessarily. I can not decide how far Argelander's influence affected the course of events; the fact is simply that the observatory and the city were spared, although a battery of defense in the park seems carelessly to have directed its fire against the English gun-boats in the beginning.

We have not the time to-day to follow Argelander's activity in Bonn and to give an account of the many important works which he there undertook, which occupied him even to the last weeks of his life. I shall only allow myself to enumerate the principal works published by him there. These are: 1. "Bonner nordliche Zonen," observed in a small temporary observatory while the new one was building. 2, "Uranometria nova," an atlas which gives all the stars visible to the naked eye in Middle Europe. 3. Bonner sudliche Zonen" which were observed from 1849 to 1852. 4. Observations and investigations in regard to the variable stars. 5, "Critical investigations in regard to old and new collections of observations, a work which Argelander continued with great enthusiasm even to the last days of his life. 6, "Durchmustrung des nordlichen Himmels. This most comprehensive work of his was produced between the years 1853–1862. His purpose was to produce a complete catalogue of all the stars in the northern hemisphere, down to the ninth magnitude, and beyond that. The first plan of this magnificent undertaking was sketched during the spring of 1852, but it could not at once be put in to operation. During the summer of 1853 Argelander with his friend, W. Struve, who was then returning from abroad, made a journey to Pulkowa to study the greatest of all astronomical

institutions. On the journey by way of Stockholm he visited Helsingfors. How painful it must have been to him not to be able to pay a visit to his old observatory. The terrible cholera epidemic then raged in the city. At the observatory itself a case had occurred and some of Argelander's friends, who on the announcement of his coming had assembled in the city, advised him most earnestly not to expose himself to the contagion. After a visit of a few hours the journey was continued; it was the last time he saw his former dear home. He always continued to long to make one more visit here but circumstances made the fulfillment of his wish impossible. During the time that he was absent from Bonn the last named work was again begun in earnest by the assistant of the observatory, Shoenfeld, and by myself who in the beginning only took part in the observations as a volunteer. When Argelander in the fall returned from his long journey we were able to show a considerable number of zone observations and by means of these establish the possibility of performing the whole work with our limited means, and in spite of the doubts which various persons entertained in regard to a project, the idea of which certainly seemed to them grand but impracticable; it was after about nine consecutive years of severe exertions brought to a successful close, thanks especially to the untiring zeal and industry with which our esteemed teacher inspired the rest of us. The result forms a catalogue of all the fixed stars down to the magnitude 9.5, which are found between the North Pole and two degrees south declintion, in number about 324,000. An atlas of forty large sheets contains all these stars. There is also a critical inquiry in regard to star catalogues previously published and a special catalogue of more than 34,000 stars, which in this time Argelander determined by meridian observations alone. We are sorry to say that the continuation of this comprehensive work to the South Pole is still wanting. It can be made only in some of the observatories situated south of the Equator. The question frequently arose as to the possibility of sending an expedition for this sole purpose to the Cape of Good Hope, but such an expedition would

have demanded an immense sacrifice of money, and there was especially a lack of young men who would be willing for a period of perhaps ten years to bury themselves in a foreign land, far removed from communication with the rest of the world. Hence the provision for the balance of this astronomical need would have to be left to the astronomers living in the southern hemisphere. May they follow Argelander's example and complete the catalogue of the fixed stars according to the same plan as was adopted for the investigation of the northern sky.

Argelander's activity was far from closed with the period to which we have now arrived. He could never be idle and in addition to his continual attention to his academic duties he was constantly occupied with investigations in regard to the fixed stars, to which he had devoted the most of his life. His influence on other astronomers was very great. The wider his fame spread, the more he was sought by astronomers in Europe and America who came to Bonn to hear his opinion in regard to important scientific works and the building of new observatories. Thus he was able to accomplish indirectly for his science more than any other man, and many of the astronomers now living are in this respect deeply indebted to him.

In his work Argelander was conservative, he disliked many of the new theories that developed in astronomy and the many new methods of observation, the necessity for which he could not consider to be well established. He was an adherent to Lalande's maxim; "Le mieux est l'ennemi du bien," in the sense in which it is to be understood, and its correctness has repeatedly been proved by experience in as much as they who are constantly studying improvements in the methods seldom accomplish anything of real importance. But he never objected to others doing as they pleased; he only asked that they should try to accomplish something for the advancement of science.

I especially desire to call attention to his generous treatment of young scientists. Above all he sought to encourage them to do independent work, and he expressed himself in the strongest terms against the principle which has been

and still is in vogue, for instance at the observatories in England, that the assistants are mere tools in the hands of the directors, the result of which is that they very seldom develop into independent investigators. He was always ready to give his assistants liberty to undertake independent investigations and he watched with eagerness to see whether they succeeded in accomplishing anything for the good of science. His example in this regard has doubtless had an

(To be Continued.)

TRANSIT OF VENUS, DEC. 6, 1882.

[Communicated by authority of the United States Transit-of-Venus Commission.]

All the operations undertaken by the United States Government in connection with the observations of the Transit-of-Venus in 1874 and 1882 were carried out under the direction of the United States Transit-of-Venus Commission. In the beginning of 1882 the instruments used in 1874 were examined and repaired; all necessary changes being made in them, and some new instruments were purchased. At a very early stage of its deliberations the Commission decided to rely mainly upon the photographic method of observing; ond to ascertain the most suitable kind of emulsion an extensive series of experiments was made by Mr. Joseph A. Rogers, who also prepared all the emulsion needed for the various parties.

The number of parties organized was the same as at the last transit, namely, eight; of which four remained in the United States, and four were sent to the southern hemisphere. The names of the persons comprising the various parties, and the stations at which they observed, are as follows:

HOME STATIONS.

United States Naval Observatory, Washington, D. C.

Professor Wm. Harkness, United States Navy, Chief Astronomer; Mr. Joseph A. Rogers, Washington, D. C., Assistant; Professor A. H. Buchanan, Lebanon, Tenn., As-

sistant; Lieut. Com'dr, C. H. Davis, United States Navy, Assistant.

Cedar Keys, Florida.

Professor J. R. Eastman, United States Navy, Chief Astronomer; Lieut. John A. Norris, United States Navy, Assistant Astronomer; Mr. George Prince, Photographer, Treasury Department, Photographer; Mr. George F. Maxwell, Washington, D. C., Assistant Photographer.

San Antonio, Texas.

Professor Asaph Hall, United States Navy, Chief Astronomer; Mr. R. L. Woodward, Detroit, Mich., Assistant Astronomer; Mr. D. R. Holmes, Milford, Del., Photographer; Mr. George H. Hurlbut, Belvidere, Ill., Assistant Photographer.

Cerro Roblero, New Mexico.

Professor George Davidson, United States Coast and Geodetic Survey, Chief Astronomer; Mr. J. S. Lawson United States Coast and Geodetic Survey, Assistant Astronomer; Mr. J. F. Pratt, United States Coast and Geodetic Survey, Second Assistant Astronomer; Mr. D. C. Chapman, United States Coast and Geodetic Survey, Photographer; Mr. T. S. Tappan, Bellaire, Ohio, Assistant Photographer.

FOREIGN STATIONS.

Wellington, South Africa.—Professor Simon Newcomb, United States Navy, Chief Astronomer; Lieut. Thos. L. Casey, Jr., United States Army, Assistant Astronomer; Ensign J. H. L. Holcombe, United States Navy, Additional Assistant Astronomer; Mr. Julius Ulke, Washington, D. C., Photographer.

Santa Cruz, Patagonia.—Lieut. Samuel W. Very, United States Navy, Chief Astronomer; Mr. O. B. Wheeler, Detroit, Mich., Assistant Astronomer; Mr. Wm. Bell, Philadelphia, Penn., Photographer; Mr. Irvin Stanley, Indianapolis, Ind., Assistant Photographer.

Santiago de Chile.—Professor Lewis Boss, Albany, N. Y., Chief Astronomer; Mr. Miles Rock, Naval Observatory, Washington, Assistant Astronomer; Mr. Theodore C. Marcean, Washington, D. C., Photographer; Mr. Charles S. Cudlip, Washington, D C., Assistant Photographer.

Auckland, New Zealand.—Mr. Edwin Smith, United

States Coast and Geodetic Survey, Chief Astronomer; Professor H. S. Pritchett, St. Louis, Mo., Assistant Astronomer; Mr. Augustus Story, Boston, Mass., Photographer; Mr. Gustav Theilkuhl, Washington, D. C., Assistant Photographer.

In addition to these parties, which were entirely fitted out by the Transit-of-Venus Commission, there was another at Princeton, New Jersey, under the direction of Professor C. A. Young, assisted by Professor C. F. Brackett, Professor Wm. Libbey, Jr., Mr. Henry Crew, Mr. W. F. Magie, Mr. F. Fisher, Mr. F. A. Young and Mr. McNeill. For this station, only the glass plates and emulsion were furnished by the Transit-of-Venus Commission. All the instruments and apparatus employed are the property of Princeton College, but as the photo-heliograph is an exact duplicate of those furnished to the government parties, and was used in the same way, all the pictures taken by it are strictly comparable with those obtained at the other stations, and Professor Young has kindly given them to the Transit-of-Venus Commission for reduction and discussion.

A station was also established at the Lick observatory, Mount Hamilton, Cal., by the trustees of "The James Lick Trust." The horizontal photo-heliograph there employed was similar in all essential parts to those used at the government stations, and in compliance with the request of Capt. Floyd, the operations with it were directed by Professor D. P. Todd, of Amherst College. So far as possible, everything was done in strict accordance with the instructions issued for the guidance of the government parties, and 123 photographs of the transit were obtained, nearly all of which are believed to be measurable. The Lick trustees have kindly lent these negatives to the Commission for measurement and discussion, and the results from them will appear in the Government reports.

On the day of the transit the sky was perfectly clear at about half the stations; while at the remainder, clouds impeded the work more or less, but nowhere to the extent of producing failure. The results obtained by the different partis are as follows:

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STATIONS.	Photog. Plates.		Contacts Observed.			
	Exposed	Meas.	1st.	2d.	3d.	4th.
Washington, D. C.	53	49				
Prof. Wm Harkness.				1	1	
Com. W. T. Sampson.			1	1	1	1
Prof. E. Frisby.			1	1	1	1
Ensign S. J. Brown.					1	1
Mr. Joseph A. Rogers.				1	1	1
Cedar Keys, Florida.	176	167				
Prof. J. R. Eastman.				1	1	1
San Antonio, Texas.	204	121				
Prof. A. Hall.					1	1
Rev. Dr. Richardson.					1	1
Capt. W. R. Livermore.					1	
Cerro Roblero, N. Mexico.	216	216				
Prof. Geo. Davidson.			1	1	1	1
Mr. J. S. Lawson.			1	1		
Mr. J. F. Pratt.					1	1
Princeton, N. J.	190	127				
Lick Observatory, Cal.	123	115				
Total for N. Hemisphere.	961	795	4	7	11	9
Wellington, South Africa.	236	200				
Prof. S. Newcomb.			1	1		
Lieut. T. L. Casey.			1	1		
Ensign J. H. L. Holcombe.			1	1		
Miss M. E. Cummings.			1	1		
Miss A. P. Ferguson.			1	1		
Miss J. N. Brown.			1	1		
Santa Cruz, Patagonia.	224	204				
Lieut S. W. Very.			1	1	1	1
Mr. O. B. Wheeler.			1	1	1	1
Santiago, Chile.	204	152				
Prof. Lewis Boss.			1	1	1	1
Mr. Miles Rock.			1	1	1	1
Auckland, N. Zealand.	74	31				
M. Edwin Smith.						1
Prof. H. S. Pritchett.					1	1
Mr. John J. Steveson.					1	1
Total for S. Hemisphere.	738	587	10	10	6	7
Total for both Hemispheres	1700	1382	14	17	17	17

On March 1, 1883, Mr. Joseph A. Rogers resigned his position as Chief Photographer to the Commission in order to accept a more lucrative position in Philadelphia. The Commission felt much regret at parting with him, and some experiments having an important bearing on astronomical photography, which he was carrying out, are yet incomplete. On April 1, 1883, the Commission secured the services of Mr. R. S. Woodward to assist in the reduction of the transit observations; and on July 1st, Messrs. A. S. Flint, Emil Wiessner and Asaph Hall, Jr., were employed for the same purpose. Up to the present time, these gentlemen have read all the measurable negatives obtained at Washington, Cedar Keys, and San Antonio, and are now engaged on the Cerro Roblero negatives. Considerable progress has also been made in the reductions based upon these measurements. It is believed that the solar parallax yielded by the transits of 1874 and 1882 must depend principally upon the photographs; and when it is remembered that only 221 measurable negatives were obtained in 1874, the remarkable success of the operations of last December will be apparent. If no unforeseen delay occurs, probably the definitive result from the photographs of both transits can be arrived at in about four years.

Printed instructions for making optical observations of the transit were extensively distributed to persons known to be interested in astronomy, and the Western Union Telegraph company generously undertook to furnish the noon time-signals from the Naval Observatory to all intending observers who might apply for them anywhere within the United States on December 4th, 5th, 6th and 7th. These facilities resulted in bringing nearly every telescope in the country into action; and notwithstanding the bad weather which prevailed in many places, the Transit-of-Venus Commission has received ninety-two roports from persons located within the United States.

There are several minor planets, recently discovered, that have not received names.

THE INTRA-MERCURIAL PLANET QUESTION NOT SETTLED.

LEWIS SWIFT, ROCHESTER, N. Y.

Scientific journals both in this county and in Europe appear to entertain the idea that because no intra-Mercurial planet during the last total eclipse was seen, none therefore exists. To this view I think I am justified in taking exceptions. As well might I assert that there was no comet where Brooks discovered that of 1812, because on three different occasions only a few days previously, I searched thoroughly over the region and found none. In sweeping for comets one can make his fields lap as he desires, as there are always plenty of stars to guide him, but how different in searching for intra-Mercurial planets when the eye sees nothing but a flood of light with not an object to guide him. I speak from experience when I say that sweeps made under such circumstances must necessarily be made more or less at random.

Since the eclipse of 1878 when I saw the two red stars, I have been of the opinion that their excessive redness was somehow the result of some peculiarity of the eclipse, and that the color was no argument in favor of their planetary character. At that time Delta *Cancri* was much nearer the *Sun* than were my objects, and yet I never heard of any recording it as red. Again I saw all the phenomena of the eclipse both at the beginning and end of totality, and yet I failed to see Delta, although the field of my telescope was $1\frac{1}{2}^{\circ}$ in diameter. Would I be justified in asserting that there was no star there because I failed to see it?

Now if it can be shown that the stars are not made ruddy by being in apparent proximity to the totally eclipsed *Sun*, it will go a long way towards proving that the deep red tint of the objects seen by Watson and myself were wholly due to their planetary character, and nearness to the *Sun*. Prof. Trouvelot informed me that he saw two white stars within the corona thus substantiating the view taken above. I saw two stars just without the corona both red

only 7′ or 8′ apart. Will any one pretend to assert that two such stars exist near Theta *Cancri*?

Again Trouvelot says he saw with the finder of his telescope a very red star about 3° northwest of the *Sun*, and, his assistant audibly exclaimed during the totality "I see a red star!" When asked after the eclipse where he saw it, pointed at or near the place where Trouvelot's star was. These facts I obtained from his own lips while spending a day with me at the Warner Observatory. He undoubtedly would have seen it with his large telescope, and perhaps obtained a rough position of it, had he not been compelled to obey his superior to cease searching when time was called, to observe the closing scenes of totality.

It will not do to say that M. Janssen's photographs show no new objects. He had neither developed them, nor subjected them to a critical examination, and very wisely too had refused others the privilege of doing so for the cogent reason that they were not ready and no time could be spared.

Even if he does not find any new objects on his negatives it is no proof of their non-existence, for if visible they were red, and such stars require a different time-exposure for depiction on the sensitized plates.

Just what value ought to be ascribed to the non-existence of images of objects invisible to the naked eye, and where the sky and earth are illuminated beyond that given by a full moon, remains to be seen. It is said he had previously photographed the region of sky to be occupied by the *Sun* on the day of the eclipse for comparison with it as photographed during the eclipsed *Sun*. The world would like to know just how he obtained the same conditions of air and sky as was afforded by the *Sun* in total eclipse.

When M. Janssen ascertains how many known stars are omitted entirely, the world will be able to judge whether photography has or has not settled the intra-Mercurial planet question.

Happily the time is not far distant when the problem can be solved, and if there is not too much apathy on the part of astronomers this matter will be settled for all time.

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The great eclipse of 1886 will afford an admirable and comparatively easy opportunity, if rightly managed, to dispel every doubt.

Only across the Atlantic on the coast of Africa, there will occur in August of that year an eclipse lasting almost as long as did the last one at Caroline Island, and in every respect superior to that for a thorough and systematic search for the suspected objects (for there are more than one). Until then let us hold the matter in obeyance. My faith in their existence was never stronger than to-day.

WARNER OBSERVATORY, ROCHESTER, Oct. 20, 1883.

THE PERIOD OF THE DOUBLE-STAR DELTA EQUULEI (0Σ 535).

S. W. BURNHAM, CHICAGO.

The 4½ magnitude star, δ Equulei, has been known as a wide pair since the observations of Sir. WILLIAM HERSCHEL by whom it was first measured in 1781. It was subsequently measured by SOUTH, and later by W. STRUVE and others. As a double-star in these respective catalogues it is known as H. IV. 37 = S 782 = Σ 2777.

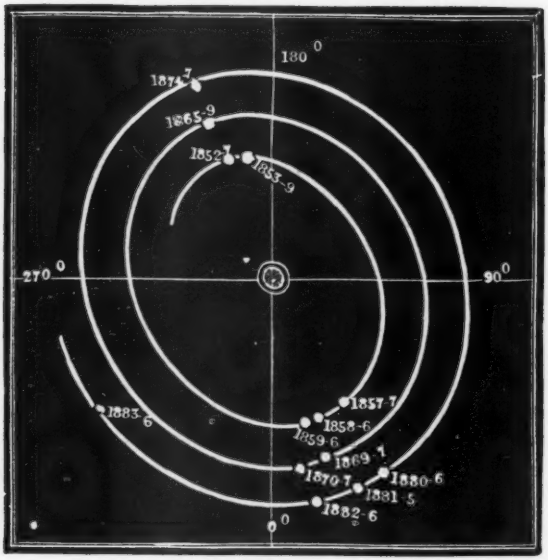
In 1852 OTTO STRUVE discovered that the principal star of the wide pair was itself an excessively close pair, and it was measured by this observer at the Pulkowa observatory a number of nights between that time and 1874. It was evident that the motion was rapid, and the period probably as short as that of any pair known, but the measures were isolated and scattering, and too uncertain as to the quadrant to give any definite result, although it was supposed the period was some multiple of six or seven years. In 1880 I made a set of measures on five nights under very favorable conditions with the 18½-inch Refractor of the Dearborn observatory. The components were then well separated by that Refractor, the distance being a little less than 0″.4, which is about their maximum distance. These measures have been repeated each year since down to the present time. The distance now is only about 0″.2, and it will therefore appear single in all but the largest and best Re-

fractors. These later measures are important in this investigation since they not only give definitely the direction, and the rate of motion in this part of the orbit, but also fix with certainty the direction of the smaller star, which was very doubtful, to say the least, from the prior observations. The components are so nearly equal that the difference, which is only about three-tenths of a magnitude, would not be apparent in so close a pair with the ordinary telescope used. With the single exception of my observations of the present year, all the measures have been made in about the same angle, ($\pm$ 180°), or at the maximum distance of the stars. By making use of the later measures and taking them as the starting point, it seemed possible to work back and so correct the earlier ones for quadrant and arrange the whole, as to give a closely approximate period. For this purpose it is not necessary to consider the distances, which in many cases are only estimated, or roughly measured. All the published measures to this date are given below. They have been made at Pulkowa and Chicago, with the exception of those of 1869 by DUNER and 1870 at the Harvard College observatory. A correction of 180° has been applied to the angles marked (*).

1852.66	200°.6*	*OΣ*	2 nights.
1853.91	191 .9	*OΣ*	1 night.
1857.67	29 .5*	*OΣ*	2 nights.
1858.59	16 .8	*OΣ*	1 night.
1859.65	13 .5	*OΣ*	1 night.
1865.91	203 .3	*OΣ*	1 night.
1869.74	15 .9*	Hd. Coll.	6 nights.
1870.73	8.	Duner	1 night.
1874.72	202 .3*	*OΣ*	3 nights.
1880.60	29 .1	*β*	5 nights.
1881.46	22 .1	*β*	5 nights.
1882.63	9 .8	*β*	3 nights.
1883.55	307 .6	*β*	3 nights.

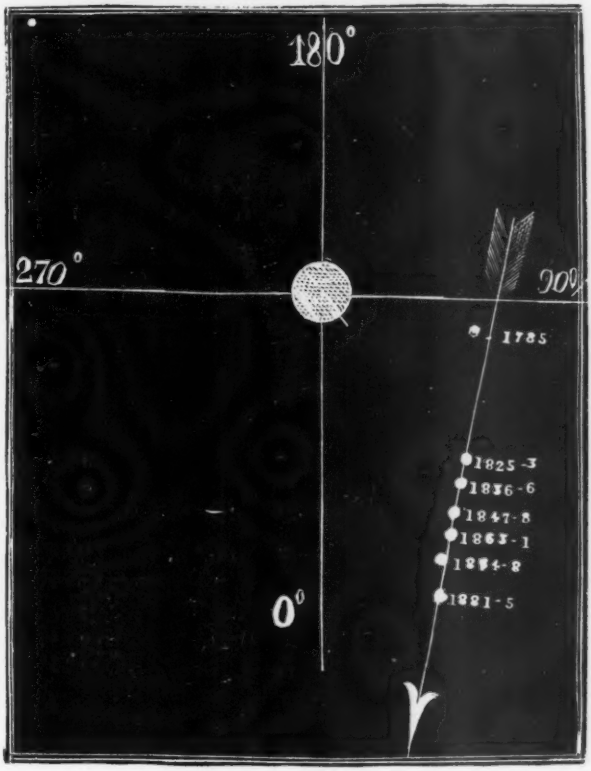
[The hyphens in the dates of both cuts following should have been periods. The figures after the hyphens are decimals of the years as shown in the table above.—Ed.]

These measures are shown in the following diagram:



If the measures are reasonably accurate, and the proper quadrant has been assigned to those made previous to 1881, it is apparent that the period must be much shorter than that of any other pair now known. They would seem to indicate when taken together a period of about 10.8 years. Measures made in 1885, when the smaller component should be at nearly the maximum distance in the opposite quadrant, will show positively whether any of the angles have been erroneously reversed in this diagram. I think there can be no error in this respect, but it is desirable that careful measures with adequate instruments be made each year when the distance is sufficient for the purpose. At the greatest elongation there should be no difficulty in observing it with an ordinary instrument of the best definition. It will certainly be very close and perhaps unmeasurable in 1884, but for the two or three following years it should be wide enough to be fairly well measured.

The change in the old companion, now nearly 40″ distant, is produced by the proper motion of the brighter star, which is given as +0″.08 in R. A. and −0″.28 in P. D. The rate and direction of this motion will be best seen from the following diagram, giving, on a scale of 1 inch to 20″ a few of the best measured positions:



From this it appears that the apparent motion of the companion is in the direction of about 350° at the rate of about 0.″28 per annum. Evidently the nearest approach to the bright star must have been not far from the date of

Sir William Herschel's observation, or more than a century ago. By reason of the rapid orbtial motion of the close pair, and its movement through space this is undoubtedly the most important and interesting of all the sidereal systems which have been investigated.

THE TOOLS OF THE ASTRONOMER.

PROFESSOR M. W. HARRINGTON, ANN ARBOR, MICH.

Let us imagine a traveller in Central Africa, whom we may suppose to have all the necessary mental equipment for a traveller, and to be gifted besides with an acute and judicious mind. Let us suppose however that our traveller is entirely without instruments. We may provide him with note-book and paper, because, had he not them his memory might supply their place, but we will not give him even a watch in the way of instruments. Our traveller may be successful in overcoming all obstacles and withstanding all dangers. Fevers pass him by; native princes he placates, and predatory tribes he avoids. He crosses here a great river, visits there a lofty mountain peak from which the country seems laid out as on a map below him; at one time he enters the capital city of a great nation heretofore unknown to civilized man, at another he wanders along the shores of an inland sea. He may in turn review the features of the country, may at one time have within his grasp the key to its geography:—and yet on his return, how much would a traveller thus equipped be able to add to the great body of geographical knowledge? He saw rivers and lakes and mountains, but where was he when he saw them? How long or broad or high were they? What information can he give us which will take its place as a permanent part of the science whose votary he might be?

Now let us imagine another traveller, perhaps not nearly so well equipped mentally, but let us give him a few common instruments and the power to use them successfully:—a chronometer, a sextant, a compass, a barometer. Let him travel the path of the preceding, and, after using his instru-

ments where practicable, let him return His note-book will contain information of value, his deductions are essential parts of knowledge in its present state. They may be amplified or corrected but they can never be dispensed with.

The difference between the two travellers was simply that one was supplied with a means of correcting his judgments by accurate measurment, the other was not. The judgment which was submitted to the test of measurment—to the foot-rule, so to speak—was of much more value than the judgment which was not. The value of the foot-rule check to our judgments is often forgotten. While the higher mental faculties give us the part of our structure in which we have most occasion to be proud, we must remember, that, like other best things, it is of slowest growth and needs most the support of things around it. A young spider, or fish, or partridge may take up the duties of life before it is a day old and perform them as well as at any later period, but an infant is helpless for months and dependent for many years. Excellent things are always of slow growth and comparatively helpless. Our refined breeds of cattle are less able to withstand storms or other hardship. A race-horse of good pedigree is almost human in its intelligence and helplessness. The cur can care for himself, the blooded dog must be cared for.

The sciences depend absolutely on observation and for astronomy and her sisters this observation must be mainly instrumental. The astronomer is dependent on his tools; the observatory is but the receptacle of his tools, his tool-chest so to speak. At this celebration of the foundation of another of these tool-chests of the astronomer it is eminently proper that we should cast a glance over the history and development of these instruments. We will find that as they developed the science has developed and that with each new instrument there has been an influx of new facts, a sudden development of astronomical theory and a corresponding growth of mathematics and physics. We may also be able to hint at the general laws under which instruments have developed—laws reminding us much of of the laws drawn from fossils of animals and plants. But

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this development has a human interest which is lacking in the natural sciences. It is a development of the human mind and its history is rich in human dramas, sometimes tragedies, sometimes comedies. 'Tis said that the most charming book in the world to read is a candid autobiography; in the history of astronomical instruments and their present forms we have the autobiography of the human will in its battle against nature.

Astronomy is probably the oldest of the sciences, so old that its origin is purely conjectural. Indeed its origin could not be historical for it must exist and be capable of constructing a chronology before history could have a beginning. To know its oldest state we must consult the opinions of the infancy of the race. But a young child in possession of the facts of astronomy as visible without instrumental aid and his ideas on the subject will suggest those of the earliest astronomers. The development of a science is the development of the individual. We live out for ourselves the universal progress and its infancy is typified in ours.

The infancy of a science is the period in which it yields childlike to the uncontrolled imagination. The untrained intellect looked on the glowing objects of astronomical study as objects of adoration. Hence arose the great number of solar, auroral and other myths which we see dimly on the horizon of history and which have lately occupied the attention of a large number of specialists. The Babylonian Ra was the *Sun*, Astarte the *Moon*, Moloch, *Saturn*, and so on. It was the pre-instrumental stage of the science and lasted many ages with civilized men and is yet found among some savage races. Its accumulation of facts was not small. The chief features of the diurnal and annual motion were discovered, the meridian and cardinal points ascertained and something was known of the planets or wandering stars.

But the purely imaginative stage must pass by in the history of science as it does in that of a race or an individual. The mind requires a closer scrutiny and comparison of facts than mere inspection can give. At this age a wise father

puts into his boy's hands a few simple tools and shows him how to make a windmill, waterwheel and cart. It is the jack-knife period of the boy and he has this advantage that his jack-knife is invented and ready for him while the young science must invent its own tools. With the science, we may call this the *Gnomon-Period.* The gnomon is a staff set up with some determinate direction where the *Sun* (or *Moon*) may cause it to cast a shadow. The sun-dial is one of its forms. By it could be determined rudely the time of day, the position of solstices and equinoxes, the obliquity of the ecliptic and other approximate angulation. With the aid of a rude time-keeper—as a sand or water-clock, other measurements could be made, and a comparison with previous records for ages past would permit some empirical deductions—as the Saros, and consequent predictions, as of eclipses. Already the science is useful and is patronized by princes. Being a part of religion its students are priests and observatories temples. It is a curious fact *templum* is the diminutive of *tempus* and means a space in the sky or an auspicious place on the *Earth.* Hence our word *temple* is a survival of this stage of our own science. This was the astronomy of the Chaldeans and doubtless of other ancient races. The sun-dial was a favorite instrument in Europe until replaced by the clock, and is employed to this day by some less civilized races, as the Chinese. In this age the astronomer was chiefly an astrologer and the science was considered sufficiently practical to be patronized by kings. Satisfied with the accumulation of new facts which followed the use of the gnomon, it attempted little new and remained stationary for ages.

Then comes the period of the *Astrolabe* which begins when the Greek mind was fairly turned to astronomical subjects, but the development was made rather at Rhodes, at Alexandria, in Asia Minor, in Italy, Sicily, at Marseilles even, than in Greece. Speculation preceded and gave the spur to the advance in instruments, as happens in youth when the reflective powers awake.

(To be Continued.)

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EDITORIAL NOTES.

Numbers two and three of vol. 1 of the MESSENGER are nearly exhausted. Any person returning these numbers to us in good condition will be paid twenty cents each for them.

Dr. C. H. F. PETERS of Litchfield observatory, Clinton, N. Y. is in Europe, and will attend the meeting of the German Astronomical Society at Vienna. He is expected to return in December.

Amateur readers have requested, that the places of important celestial bodies noticed in the MESSENGER be referred to near prominent objects in the same constellation, so that they may be found by the use of small glasses without circles. This will be done hereafter, generally.

Mr. WINSLOW UPTON of Washington, D. C. has been elected professor of Astronomy at Brown university, Providence, R. I. His acceptance of the position is conditional upon the erection of a small observatory designed mainly for the purposes of instructions. This, we understand, the authorities are intending to do. The choice of Mr. UPTON is an excellent one, and timely; for a prominent western institution has been on the point of doing him a similar honor.

A double-star is usually recommended as a test for accurate focusing of the eye-piece. In our last issue, Professor HOLDEN claimed that a star-cluster will give better results. This, Professor WILLIAM R. BROOKS of Phelps, N. Y. heartily confirms, and in a letter of recent date says, in comet seeking before commencing to sweep he always focuses on a star-cluster—a rather loose one of small stars he thinks is best. The slightest change of focus in such an object is perceptible which is not the case with a double-star in his experience.

October 13th Professor C. A. YOUNG wrote that in observing BROOKS' (Pons) comet on Oct. 5, it was compared with a star of the 8th magnitude, viz: Oeltzen's Argelander No. 16314. The mean place for this star for 1883.0 is

R. A. $= 16^h\ 29^m\ 26.^s3$
Decl, $= 58°\ 00'\ 49.''9$

On examining the star with a higher power it was found to be double: P $219.°5$; s $1.''59$; magnitude, $8-9\frac{1}{2}$.

A minute nebula was also in the same field—very faint, slightly brighter at the center—referred to the same star its mean right ascension and declination for 1883.0 are respectively

$16^h\ 29^m\ 25^s$ and
$57°\ 57'\ 30''$.

Professor YOUNG thinks both are new.

For some years past, the question of simplifying the time standards for public uses has been under discussion in most of the prominent scientific societies of the world. From these sources various plans, looking more or less toward uniformity, have been suggested, each of which certainly was an improvement, in some particulars, on the custom now in use; yet no one plan seemed to have friends enough to secure for it anything like a general recognition in scientific circles. This has been notably the case in our own country. For more than three years the American Asssociation for the Advancement of Science has had a standing committee on the subject of standards for uniform time, and this committee during this time has been able to make only partial reports, upon which the association has based no action that was important at all, except to discharge the committee on its own request at the last annual meeting in Minneapolis.

During the last year, leading railway officials became interested in the theme of uniform time, as an advantage to transportation companies, and conventions of managers of railway companies from all parts of the United States and Canada were held in St. Louis, New York and Chicago. As a result of these deliberations it was decided at the convention in Chicago, last month, to adopt the following plan which will go into effect generally during the present months in all probability. The principles which govern the plan proposed are as follows:

1st. That the same standard should govern as many roads as possible.

2d. That the standards should not extend over so large an area of territory as to cause standard time to differ by more than about thirty minutes from local time.

3d. That each standard should vary from the adjacent standards by the most readily calculated difference, that of an even hour.

4th. That changes from one standard to another should be made at well-known points of departure.

5th. That these changes should be made at the termini of roads, where changes now occur, except on the trans-continental lines and in a few other unavoidable cases, where they can be made at the ends of divisions.

6th. That the seventy-fifth meridian west from Greenwich being almost precisely the central meridian for the system of roads now using standards based upon the time of Eastern cities; and the ninetieth meridian being equally central for the roads now running by the time of Western cities, the time of those meridians should be adopted for the territory which includes nearly ninety per cent. of the whole railway system. The hour meridians east and west of those above named are equally well adapted as central meridians for the roads in the section of country adjacent thereto.

7th. That by the adoption of this system all necessity for translating

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railroad time into local time will be avoided, it being a fact that such translations are not now made at any city where all roads run by the same standard.

"Gegenschein."—On the night of the 4th inst. I was struck with the appearance of a large hazy mass of light south of the zenith and near *α Pegasi*. At first I thought it might be a slight cloud, but it remained pretty constant, clouds preventing any further notice. It was subsequently seen for several nights, but cloudy weather prevented any particular notice of it. On the 8th I was again struck with the peculiar appearance, and found that it had moved considerably to the east; at midnight I carefully located it on a star chart, and found its centre to be about $0^h\ 52^m$; $+6°$. Since then moonlight and haze have prevented any further observation of it. This phenomenon was then an entire stranger to me, but I have since found an interesting article in *Science Observer*, (Nos. 37-38) by Mr. ARTHUR SEARLE of the Harvard College observatory, in which he mentions under the title of 'Gegenschein" a phenomenon that is without doubt the same as seen by me. The character of the object is Zodiacal, and it is generally seen in opposition to the *Sun*. The phenomenon that I have observed was exactly opposite the *Sun* and lying on the Zodiac. A physical description of its appearance may be of value. It was 20° in diameter, roundish, resembling a patch of dense haze or fog, pretty even in light, ill defined borders; very dense by averted vision, dimming the stars over which it passed. Very faint extensions were noticed along the Zodiac; I should say the object was as noticeable almost as the Milky Way near *Orion*. When looked at straight it differed greatly. I have seen dim hazy clouds at night which resembled it in appearance. I would further add that the Zodiacal light has been very intense in mornings lately, and bands of faint light have been repeatedly seen from horizon to horizon during the entire night, these always lay along the ecliptic.

E. E. BARNARD.

VANDERBILT UNIVERSITY, NASHVILLE, Tenn., Oct. 12, 1883.

No. 2545 *Astronomische Nachrichten* contains an important article by Professor C. A. YOUNG of Princeton on the ellipticity and surface-markings of the planet *Uranus*. The result of his work on the ellipticity of the planet is about one-fourteenth which is a little less than that obtained by SCHIAPARELLI, given as one-eleventh. Professor YOUNG is strongly impressed that his value is too great, that one-fifteenth is nearer the truth. His account of the surface-markings which were observed during the late opposition furnishes useful information for the physical study of the planet.

"In the course of the observations, markings resembling the belts of Jupiter and Saturn were seen upon the planet's disc whenever vision was good, and the image bright and steady. They were of

course very faint, but they were repeatedly seen not only by myself but by my assistant Mr. McNeill, and by Professor Brackett. * * *

On May 25 the western Pole was notably brighter than the eastern; and the western belt showed a little spur running out toward the pole; this marking unfortunately never recurred. On June 1, Mr. McNeill suspected two very faint polar belts in addition to the equatoriel.

On June 11 the equatorial space between the belts seemed to be unusually wide.

On several occasions the trend ot the belts appeared to make a considerable angle with the line of the satellites; a very puzzling circumstance in view of Tisserand's results, if it is really a fact. During the whole series of observations the position angle of the major axis of the satellite-orbits varied only a few minutes from 15°.

On June 1, I measured the position angle of the belts as 36°, and a few minutes later Mr. McNeill made it 43°. Still later in the evening however Prof. Brackett set the wire at 15°. But at that time, although it was darker, the seeing was worse, and the image was unsteady, so that the belts were difficult to make out.

On June 11 the belts were rather suspected than fairly seen, vision being only indifferent. On June 12 ($8^h 45^m$ Wash. Time) the belts seemed to Mr. McNeill darker on the east side of the planet than on the west.

On June 15 the belts were again seen inclined to the line of the satellites, to which, Oberon and Titania, were conspicuously visible at position-angles of 14° and 15°, and at distances of about 40" and 30" respectively. My own measurement of the position-angle of the belts at this time ($8^h 45^m$ W. m. T.) was 32°, and Mr. McNeill made it 37° a few minutes after. Of course no great weight is to be assigned to this angle, but the six different settings by Mr. McNeill and myself all ranged within 10° of each other. On the 19th the seeing was not good enough to permit the belts to be visible.

It does not seem to be possible to deduce any reliable rotation-period from the data so far collected, but there is certainly reason to hope that another year something more definite may be out by some of the great telescopes.

Observers will be interested in a brief account of Mr. J. R. Hooper's daylight observations at Baltimore, Md. Under date of October 15, he says: "During a portion of last summer circumstances prevented me from doing any work at night, but I had an occasional hour at 9 a. m., and after 5 p. m. I have regularly recorded sun-spots and observed planets as they became visible west of the *Sun*. As almost nothing is said in the books, concerning daylight observations, of both stars and planets, and I was driven to do what I could, in daylight or not at all, I became very much interested in day work."

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June 5.—When *Mars* was $2\frac{1}{2}^h$ west of the *Sun*, I readily saw the disk at 8 a. m.

June 22.—*Saturn* was also seen when two hours west of the *Sun*.

July 18.—*Jupiter* was easily viewed when only one hour west of the *Sun*. This was two weeks from conjunction and in full sunlight.

July 18.—When *Mercury* was west of the *Sun* showing gibbous form the terminator was distinctly seen shaded, definition being good. On comparing the planet with *Venus*, the superior "whiteness" of *Mercury* was noticeable. I then began to try the first surface diagonal in order to get a dark field with low power, hoping to find an advantage for daylight observations. I made comparisons, using the first surface and the total-reflecting prism. I find in a dark blue sky at 8 a. m. or 6 p. m., a bright summer day, at a distance from the *Sun*, stars and planets are seen equally well in either. When the sky is "white" or misty the total prism is much better. Sometimes in an apparent blue sky the first surface gives a clear view of the planets. The star disks are much neater in the first surface. I could not make any rule as to the performance, but am satisfied that it is worth while to make trial with the first surface according to the sky and distance from the *Sun*. I tried also 3.5 magnitude stars with varying results.

One advantage I did get; in following the planet *Mercury* until conjunction, July 29, 1° 30′ west of the *Sun's* center it was very plainly seen. The total prism and dark glass would not show it.

PROPER MOTION OF THE STAR LACAILLE 8262.

The star *Lacaille* 8262 appears to have proper motions of about $-0^s.009$ and $-0''.53$ in R. A. and Dec. respectively. It has been observed here by Mr. JOHN TATLOCK, with the Repsold Circle as follows (no correction for flexure is included in the reductions, and none for divisions):

Date		α 1883.0	δ 1883.0
1883.	Sept. 26;	$19^h\ 46^m\ 17.36^s$;	$-24°\ 13'\ 50''.1$.
	Oct. 10;	17.40;	50. 7.
	Oct. 15;	17.24;	51. 1.

The place of the star for 1880 for the various authorities is

Catalogue:	α 1880.0	δ 1880.0	Mean Years.
Lacaille;	$19^h\ 47^m\ 7^s.5$;	$-24°\ 13'\ 01''$;	1750;
Argelander;	6.83;	14 2.8;	1850.8;
Yarnall;	6 62;	11.5;	1863.5; 1870.2.
Gould (Z, 1; No. 6);	6.57;	12.2;	1872.7
Stone;	6.54;	15.8;	1878.6
Tatlock;	19 47 6.50;	−24 14 17.7;	1883.7

I defer a more accurate investigation of its proper motion until the

completion of an inquiry as to the systematic errors of the catalogues in the region covered by the Washington Zones.

EDWARD S. HOLDEN.

BROOKS' COMET, (*b* 1883)—PONS 1812.

September 5.—It is quite a dim object with a slightly brighter *fleck* in the middle. Should call the comet 2′ in diameter at least; very diffuse. By averted vision pretty well seen. Aperture, 6-inch equatorial.

September 6, Aperture 6-inch.—Pretty well seen. Seen quite easily with 1¾ inch finder at $7^h\ 30^m$ in one-fourth full moonlight. (This has been doubted; Prof. SWIFT saying it was an impossibility. Nevertheless it was so seen, Prof. O. H. LANDRETH verifying this observation at the time.)

September 7.—Think it fainter. Not seen in finder.

September 24, 5 inches.—The comet is quite bright, so bright that doubt if it is that object.

September 25, 6 inches.—The comet is pretty bright to-night between 8^h and 9^h. Stands magnifying remarkably well. Its light very dense. No resemblance to its former appearance; some 3′ diameter, roundish, no traces of tail though closely looked for. No sign of nucleus, the speck of light formerly seen at its center has disappeared, or swallowed up in the general brightness. It very gradually brightens toward the center, almost even in its light; with 60 diameters there seems to be loose material about it, very distinct with 200 diameters. Pretty well defined, bright in finder.

September 26, 2.4-inch telescope.—Very easy, not large. Sky poor.

September 30, 5 inches.—Quite easy in 1¼-inch finder. Pretty bright. It seems to be not so bright as on the 25th. Feel confident could detect faint traces of tail just leaving the comet in direction away from *Sun*. There is a "smudging" of the cometary material in that direction. Occasionally pretty rapid brightning preceding the middle.

October 1, 5 inches.—Pretty bright. Saw it quite distinctly with aperture equivalent to one inch. There is a pretty abrupt, indefinite, flickering bright point preceding the center; suspicions of a short tail confirmed. Comet is passibly densein its light.

October 4.—Comet pretty bright to-night at 8^h. It is envolved among several bright stars. It is very diffuse and misty and deadened by the light of the stars. Sky not good; observed with 6 inches.

October 5, 5 inches.—Sky quite clear, comet is now quite large, pretty diffuse not near so dense as formerly, gradually brighter in the middle. A faint tail seen by glimpses, some 15′ or 20′ long, very dim, but a very decided smearing of the body of the comet in the direction of the tail. Beautifully situated with respect to a line of 8 or 9 magnitude stars. As the sky clouded it was not seen after moon-set.

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October 6, 5 inches.—Comet is large but pretty diffuse. Faint tail over ¼° long. Comet is moderately bright in the middle. It has certainly lost wonderfully in the density of its light within the last ten days, possibly its density has been expended in the formation of the tail.

October 8, 6 inches.—Swept for the comet at 10ʰ, could not find it. Considerable moonlight and sky not very good, but the comet should have been seen if as bright as on the 25th of September.

October 10, 5 inches.—Swept one-fourth hour for the comet at near 7ʰ, not found. Sky a little whitish and gibbous moon. Sweepings very slow and very close.

These two last, negative observations are given, as they may in some manner be useful in determining whether the comet has not lost in brightness.

E. E. BARNARD.

The observatory at Ann Arbor now has two volunteer assistants in addition to its regular force, consisting of the Director, Professor M. W. HARRINGTON and Assistant SCHAEBERLE. C. W. CARMAN acts as the meteorological assistant and in addition to the care of the meteorological registering instruments, he prepares reports for the State Board of Health and the Signal Service. H. A. THOMPSON proposes to make a systematical search for comets with a four-inch refractor. He has made a nine-inch reflector which proves to be a good instrument. The volunteer assistants are both students.

EDWARD ISRAEL, the astronomer for Lieutenant Greeley's party at Lady Franklin Bay, is a graduate of the University of Michigan. While pursuing his studies he showed remarkable ability in mathematics and astronomy, for he read Watson's Theoretical Astronomy with as much ease as if it were a novel. Though his circumstances are good he deliberately accepted so hazardous a mission because it would give him an opening for a career in the line of his favorite studies

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Mr. F. E. SEAGRAVE, Providence, R. I., recently sent us measures on the following four important binary stars:

Star.	Mean Epoch.	Hour Angle at observation.		Position.		Distance.	No. Obs.	Power.
		h	m	°	′	″		
γ Cassiopeiae	1883.540	— 4	0	162	26	4.78	4	367
85 Pegasi.	1883.537	— 2	30	11	16	17.34	4	367
70 Ophiuchi	1883.580	— 1	0	40	2	2.36	4	367
ξ Bootis	1883.500	— 2	15	263	28	3.33	2	489

Professor E. S. HOLDEN, of Madison, prepared an account of progress in Astronomy in the year 1881, for the Smithsonian Report of that year which is recently from the hands of the printer. It is a condensed summary of all that is important in the work of that year in all the departments of the science. It is a convenient publication for reference and the matter chosen for it is wisely selected.

I find a very remarkable object in about

A. R. = $17^h\ 56^m$

"Decl." = $27°\ 51'$

It is a small triangular hole in the Milky Way, as black as midnight. It is some 2′ in diameter, and resembles a *jet black* nebula. There are one or two faint stars in the following part of it, with a small cluster *f*. A small bright orange star is close *n. p.*, on the border of the opening. Numerous larger dark openings are in its neighborhood but none as small and decided as this. E. E. B.

Mr. W. C. POND of Hartford, Conn., kindly furnishes an observation of a recent minimum of the variable star *Algol* as requested not long ago. It was 1882, Feb. 18, $8^h\ 24^m$. This date is rather old, but as suggested by Mr. POND, it may be of some service to observers. It will be remembered that the period from one minimum to another is $2^h\ 11^m$ less than three days. If no later observation is known more recent minima may be computed from the above observation.

Names have been given to four of the minor planets recently discovered, as follows:—No. 225, Henrietta; No. 229, Adelina; No. 231, Vindebona; and No. 234, (the last discovered) Barbara.

Professor HENRY HARRISON of Jersey City has ordered a short focus telescope of Mr. TOLLES of Boston. Short focus instruments seem to be gaining favor.

Our readers will please notice the new advertisement of Mr. R. L. Allen, Providence, R. I., on second page of the cover of this number.

BOOK NOTICES.

Essentials of Geometry by Alfred H. WELSH, A. M., late Professor of Mathematics in Buchtel college, author of Development of English Literature and Language. Chicago: S. C. Griggs & Co., 1883, pp. 267.

This work covers about the usual ground found in good text-books treating of the elements of plane and solid Geometry. From a judicious selection of matter, a careful statement of definition and an order of sequence in unfolding the principles of this old and useful

branch of study, one readily perceives that the author has been a teacher, and that he knows how to anticipate the wants of the student.

Chapter XI gives a new feature in presenting *Maxima and Minima* with definitions, axioms, thirteen propositions and a variety of exercises to set out this theme in its essential relations to Geometry.

This book in its controlling purpose, is not written for science as a hand-book, but for education. Its design is to secure habits of close reasoning, and to outline a system of training whose end shall be to gain effectiveness in specific adaptation of concentrated mental energy and grasp of thought which fit young people to wrestle with the great problems of life early and successfully. As far as observed this work is properly entitled the Essentials of Geometry in matter and method, and is therefore commended generally to the educational public.

The mechanical part of the work does the publishers credit.

A Treatise on Analytical Geometry, especially as applied to the Properties of Conics, including the Modern Methods of abridged Notation, by GEORGE H. HOWISON. Messrs. Van Antwerp, Bragg & Co., Publishers, Cincinnati, O., pp. 574.

This book was published some years ago, yet it is still in our judgment the best American work on this important branch of Mathematics. On account of its full and complete discussion of the elementary principles of the science, it may also be ranked among the first treatises of the kind in the English language. Any student who will spend the time to read the entire work thoroughly, will have little trouble to pursue the writings of the great masters to which this book furnishes an adequate introduction.

Natural Philosophy by ISAAC SHARPLESS, Professor of Mathematics and Astronomy, Haverford college, and G. M. PHILLIPS, Principal of State Normal School, West Chester, Pa. Philadelphia, Messrs. J. B. Lippencott & Co., Publishers, pp. 350.

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